OPERATIONAL REQUIREMENT DOCUMENT
FOR
BATTLE FORCE TACTICAL TRAINING (BFTT)
IMPROVEMENT PROGRAM

1. General Description of Operational Requirement. The Battle Force Tactical Training (BFTT) Improvement Program is an inport shipboard combat system team training capability to provide:

- realistic joint warfare training across the spectrum of armed conflict.
- realistic unit level team training in all warfare areas.
- a means to link ships together which are in different homeports for coordinated training using Distributed Interactive Simulation (DIS) protocols.
- stimulation to shipboard sensors via onboard trainers provided by tactical equipment program managers.
- simulation of non-shipboard forces such as friendly, neutral, and enemy aircraft and submarines.
- an interface to the At-Sea Tactical Combat Training System (TCTS).

a. Due to reduced OPTEMPO and the limited availability of live training services, the Navy requires a system which trains operators and decision makers on their own equipment, inport, while simulating the at-sea environment.

b. The BFTT System will be comprised of three elements:

- an organic training system with scenario generation, stimulation/simulation control, data collection, reconstruction, and performance monitoring on each ship (closed loop).
- shorebased scenario generation, control, display, reconstruction and debrief.
- interconnectivity among platforms and the shore-based scenario generators/controllers.

The System will use a distributed architecture in order to employ existing onboard/embedded trainers. This approach will reduce costs by not duplicating existing capabilities and will support efficient use of training networks thereby minimizing data transfer requirements. The program will encourage development of

stimulators/simulators for shipboard sensors not included in existing and planned trainers.

c. The BFTT system will provide all commands responsible for training and training assessment with the capability to conduct coordinated, realistic, high stress, team training, including joint and allied, through all phases of the interdeployment training cycle, as identified within the tactical training strategy. Commands which have training responsibilities that must be supported by BFTT primarily include: the unit commanding officer; the Immediate Superior in Command (ISIC); Commander, Afloat Training Organization (ATO); Battle Group Commanders; Amphibious Ready Group Commanders; Fleet Combat Training Centers (FCTC); Training Carrier Groups; and Fleet Commanders. BFTT must provide support to:

- develop war fighting proficiency, including procedures to support Navy policy concepts of "...From the sea".
- maintain combat readiness
- conduct regular joint exercises in cooperation with other services' simulation systems - BFTT will fully support the DoD Distributed Interactive Simulation (DIS) protocols.
- support the Tactical Training Strategy (TTS)

Although no Mission Need Statement was generated for BFTT, examination of fielded and planned onboard combat system trainers, pierside trainers, shore based trainers/simulators, and the connectivity provided by the existing Multi Unit Tactical Training System (MUTTS) showed that present systems do not meet the fleet requirement to provide a coordinated, interactive capability for basic and intermediate shipboard combat system team training while inport.

2. Threat. The BFTT will have to simulate broad-based, technologically robust threat. These threats will employ a range of weaponry from low cost conventional weapons (mines and bombs), to more technologically advanced conventional weapons (high performance missiles and homing torpedoes) to sophisticated non-conventional weapons (tactical ballistic missiles with chemical, biological and nuclear warheads). The platforms employing these weapons include advanced aircraft, surface ships, shore-based systems, and nuclear and conventional powered submarines. Further detailed threat can be found in the ONI publications: DDG 51 Flight IIA System Threat Assessment TA #046-93; Amphibious Assault Ship (LX) System Threat Assessment TA #036-92; Special Warfare Exploratory Development Program Threat Assessment TA #011-92; Submarine Systems Threat Assessment TA #007-93; Ship Air Defense Systems Threat Assessment TA #012-93; Tactical Strike and Air

Warfare Systems TA #017-92 and Worldwide Threat to U.S. Navy and Marine Forces 1993-2013.

3. Shortcomings of Existing Systems. No existing or planned training system or scheme satisfies the inport combat system team training requirement. Multiple shore based and pierside trainers exist, but they are costly and insufficient in number. None of the inport training systems replicate all warfare environments for all requisite platforms. This finding was validated by the Milestone I COEA.

a. The current BFTT system Baseline 0 uses the TACDEW MOD scenario generator and the MUTTS network. This approach employs the LINK 11 M-12 message to transmit force training video. The system:

- supports anti-air warfare (AAW), limited anti-surface warfare (ASUW), and voice and link communications only.
- does not support electronic warfare (EW), a key component of AAW and ASUW.
- has limited capability to support joint war fighting and interoperability requirements.
- does not support anti-submarine warfare (ASW), amphibious warfare (AMW), mine warfare (MIW), naval gun fire support (NGFS), and strike warfare (STW).
- does not support fire control radars.
- cannot generate targets in a ship which has either lost or does not have LINK 11 communications continuity.
- affects LINK 11 net cycle time and is dependent on the availability of tactical link.

b. Existing onboard/embedded trainers (i.e., Enhanced Radar Environmental Simulator System (ERESS), SQQ-89 On Board Trainer (OBT), AEGIS Combat Training System (ACTS), Electronic Warfare (EW) OBT, Combat Simulation Test System (CSTS), etc.) support primarily single warfare areas. None of these trainers are:

- tied together to provide unit level coordinated multi-warfare combat system team training in a single ship.
- capable of adequate data collection, reconstruction and performance monitoring.
- capable of networking with systems on other ships in order to conduct coordinated training in all warfare areas.

c. TCTS is a planned (IOC FY 2000) multi-warfare at sea combat training system. It focuses on maintaining advanced fleet combat proficiency in all warfare areas during at-sea exercises and while deployed. TCTS interfaces with surface ships and submarines via the BFTT architecture system with an encrypted RF training link and an interface unit. The TCTS is not organic to the ship: system components are cross decked from platform to platform when a ship's employment requires it. TCTS will not have the interconnectivity to support all required tactical nets and data links necessary for inport training exercises between platforms in dispersed ports.

d. These shortcomings are magnified by decreasing OPTEMPO, normal crew turnover, and limited opportunities for shore based trainer time.

4. Capabilities Required:

a. System Performance.

Organic Training. Combat System Team Training conducted aboard each platform shall use only actual tactical operator positions with the exception of basic ship control. The stimulation/simulation capability is ship class and combat system dependent and will be installed in phases. The capability shall be consistent with the Organic Training Initiative (OTI) architecture developed by NAVSEA for the ERESS and CSTS training systems. It includes the following functions:

- scenario generation and control.
- stimulation/simulation control.
- data acquisition, reconstruction, display, debrief, and performance feedback.
- interface for external, i.e., off ship, scenario control and communication.

Scenario Generation and Control. Scenario generation and control must be executable at major home port sites, on platforms, at shore based training sites, and through use of BFTT architecture aboard Battle Group ships and submarines. Each platform scenario controller shall be capable of operating as a stand-alone unit, or within the integrated BFTT system. Each controller shall be capable of simultaneously processing a minimum of 2000 different scenario objects encompassing all warfare areas. Battle Group/Battle Force (BF/BG) performance assessment will be conducted at shore based training sites.

The shore site will be able to accept data from each platform and reconstruct:

- scenario ground truth
- each Warfare Commander's response
- platform response to the scenario

Platform Control Stimulation/Simulation. Stimulation of all platform sensors is required where feasible. Simulation may be used when stimulation is cost or technically prohibitive. Stimulation/simulation shall accurately replicate:

- own ship position and velocity/speed.
- complete surface; subsurface; air and space activity (e.g., radar and acoustic propagation, including sea returns, scatter and cloud/weather effects, bottom topography/composition/absorption effects and weapon simulation).
- CAP, STRIKE, AEW, EW surveillance, ASW aircraft and OTH-T.
- Friendly, neutral and enemy forces.

Each platform shall support engagements in accordance with its performance/weapons' envelopes in the electromagnetic, acoustic and atmospheric environment.

Data Collection and Reconstruction - Performance Evaluation Feedback. Each platform shall have the capability for non-intrusive monitoring of data from own ship's tactical systems, on-line quicklook limited capability, recording the data for post event processing, and dynamic replay to conduct a self assessment. Self assessment products shall be available within 15 minutes of a training event's end and permit assessment of:

- the combat system team/operator response to the scenario
- the implementation of force orders at the unit level in a multi-warfare environment
- the planning and coordination by the composite warfare commander for war-fighting disposition/employment against BG/BF threats

This data set shall be available for post event and post exercise analysis. The system will collect selected data on each platform and transmit it in real or near real time to a shore site. The shore site shall be able to query each platform for additional

data in the training network. The BFTT system will transmit all BG/BF reconstruction and performance data via the training network. The shore site shall be able to provide display, debrief, and measures of effectiveness products within six (6) hours of exercise end. Assessment products will cover all levels from the Battle Group Commander through individual operators aboard ship.

Platform Interface for External Scenario Control and Communication. Each platform shall have a single interface, standardized, for all external exercise control, performance data transfer, and communication with existing and future systems, (e.g. TCTS). This interface shall conform to the current Advanced Research Projects Agency (ARPA) protocol for Distributed Interactive Simulation (DIS).

Exercise Control. A scenario generator and controller will be located at a shore site on each coast and remote sites such as Pearl Harbor and Yokosuka. Each shore site shall have the ability to record and transfer scenarios to each ship. Each controller will be capable of supporting a minimum of eight dispersed home ports. The exercise scenario generator and controller will provide:

- pre-scripted scenarios using a real time interactive library of threats and friendly tactical actions and profiles in accordance with paragraph (2). The library of approved scenarios will be based on the Navy Tactical Warfare Data Base and permit sufficiently accurate replications of past scenarios to ensure validity of lessons learned and/or tactics evaluation. Simulated units shall conform to current threat shapes, models and standards of paragraph (2).

- freeplay capability to permit in-situation real time scenario changes, insertions, and deletions of friendly, neutral, and enemy threat units' profiles, geographic locale, and environment (electromagnetic, acoustic and atmospheric). Engagement modeling in the scenario and controller functions must be based on an up datable library of current estimates of battle damage assessment (BDA) for each platform versus a given weapon.

- the ability to start and stop the scenario on demand with simultaneous indication to all participants must be available, including the ability for continuous monitoring of any other controller connectivity and operating status at the exercise controller.

- the ability to permit friendly and threat platforms to detect and react with own sensors, or with cued intelligence information that would normally be

available. Detections and reactions will be based on realistic, programmed atmospheric, acoustic and electromagnetic environmental considerations.

- the ability to integrate platform intelligence systems without restrictive security procedures.

- the ability to independently maneuver any platform by entering a latitude, longitude, course, speed, altitude or depth individually or in any combination.

- the ability to operate individual units as semi-automated "intelligent targets", i.e., targets or groups which can respond independently to certain outside stimulations (such as sonar or radar activation) without continuous attention from scenario control personnel.

- the ability to model/simulate appropriate environments such as electromagnetic, acoustic, or atmospheric.

Platform. An organic system shall be installed in each platform that is capable of independent operation. Additionally, it shall be capable of being integrated into a network with the other platforms and the shore site to perform team training up to a battle group level. Each platform controller shall have the capability to interact with the shore site and other platforms to control the implementation of platform level stimulations and simulations. Each platform system should have the capability to collect operator and combat system performance data for self assessment of detection, engagement, kill, and battle damage assessment. The system shall permit restoration of all tactical systems to normal configuration within 30 seconds.

Game Board Characteristics. The system shall be able to simulate any geographic location in the world with the following characteristics:

- size = 16 million square miles.

- ocean depth = 16,000 feet.

- altitude = 300,000 feet.

- 2000 simultaneous air, surface and sub-surface entities, manipulated on-line, out to 1500NM (within gaming area).

- land mass and water depth contours accurate within one foot.

- usable by multi-ship BGs (11 ships)/ARGs (7 ships) The system will support 1 full BG/ARG per coast or up to 3 smaller groups, simultaneously with a maximum of 3 groups/33 ships total.

- all scenario action to be in real-time. Fast option (10:1) available for scenario positioning.

- all battle groups depicted in relative location to simulated battle group operation (latitude, longitude, course, speed, altitude and/or depth).

Interconnectivity. Connectivity of dispersed inport control and shore sites shall be accomplished by a training network. The training network shall:

- support scenario control and training coordination.

- support all data and tactical communications' requirements.

- carry performance feedback data.

- not interfere with or degrade any platform tactical circuit.

- support joint exercise training and interoperability.

Scenario Control Functions. The network must be able to transmit, receive and update entire scenarios from the exercise controller to each platform site, individually or cooperatively, including any control command stated in paragraph (4) above. Each platform's identification and simulated position must be visible at the exercise control site during the scenario evolution. All tactical connectivity voice and digital communication that would occur in normal operations must be made via this network, and capable of being monitored by the shore site. All tactical connectivity must be restored within 30 seconds on demand to normal tactical operation.

Voice Communication Function. The network will permit interactive scenario coordination from the shore site to all platform sites to initialize or pass voice information concerning the conduct of the scenario at any point in the scenario operation.

Performance Data Feedback Function. The network will permit selected performance data collection from each platform to pass in real time (transparent to each platform) to the shore site. After analysis and reconstruction of an exercise, the results shall be passed back to the master control site and to each platform.

b. Logistics and Readiness. Specific values for the BFTT

system's new equipments/capabilities are:

	Threshold	Objective
• Mean Time Between Failure (MTBF)	500 hrs	1000 hrs
• Mean Time To Repair (MTTR)	2 hrs	1 hr
• Mean Down Time (MDT)	56 hrs	41 hrs
• Operational Availability (A_0) (60 day mission)	.90	.96
• System Reliability (120 hrs continuous operation)	.76	.88
• Scheduled Maintenance Allocation	8 hrs	4 hrs

BFTT scheduled maintenance allocation is four (4) hours per system in any thirty (30) day period. At the organizational level, the BFTT System should be repairable by a third class petty officer. Readiness based sparing shall be used to spare each platform and shore site.

The system shall meet the reliability requirements specified in MIL-STD-785B. There shall be no significant impact on peace time, surge, and mobilization material, production, and maintenance requirements. There are no combat support requirements or battle damage survivability requirements.

c. Critical System Characteristics. BFTT must be designed to withstand and operate in shipboard environments including EMI/EMC inport. The BFTT design shall be such that it will not interfere with or degrade the operation of any mission critical equipment or system. The physical characteristics shall be designed and manufactured in accordance with MIL-STD-2036, using existing techniques and processes.

The performance of BFTT shall not be degraded by shipboard electromagnetic interference (EMI), nor shall BFTT degrade the operation of other shipboard equipment by the generation of EMI.

The BFTT design must safeguard classified information up to and including the SECRET/NOFORN level. All platform interfaces and training data link and shore site interfaces and equipment that process classified data shall be controlled in accordance with OPNAVINST C55 1093. No unique operational security requirements are anticipated.

Any BFTT interface that provides inputs to normal tactical operation must provide restorability upon demand within 30 seconds.

5. Integrated Logistic Support. Integrated Logistic Support (ILS) will be in accordance with DoD Directive 5000.1, DoD Instruction 5000.2, SECNAVINST 5000.2A, and OPNAVINST 5000.42D. An appropriately tailored MIL-STD-1388-1A Logistic Support Analysis (LSA) shall be initiated and performed concurrently with RDT&E efforts. Logistic support shall be adequate and available to maintain the required availability upon attainment of Initial Operational Capability (IOC).

a. Maintenance Planning. BFTT should be designed for organic support using the three levels of maintenance outlined in OPNAVINST 4790.2. The system shall not require contractor resources of technical assistance at the organizational or intermediate levels.

b. Test Equipment. All test equipment requirements shall be compatible with the Consolidated Automated Support System (CASS) automatic test equipment (ATE) unless significant economic and readiness benefits result from the use of a unique test set. ATE shall fault isolate to the functional Shop Replaceable Assembly (SRA). Built in tests and built in test equipment should be incorporated into BFTT equipment and software design. The built in test system should be able to detect 90% (required, 98% desired) of all system malfunctions and out of tolerance conditions, and isolate to one SRA with 95% confidence. The built in test false alarm rate (FAR) shall be in accordance with MIL-STD 2165 and shall not exceed one false alarm per 30 minute period of operation.

c. Human Systems Integration. The platform portion of the BFTT ships shall not require additional manpower or skills beyond those already available on-board ship. Manpower, personnel, and training (MPT) implications will be developed in accordance with OPNAVINST 15000.8 and documented in a Navy Training Plan (NTP). Operator and maintenance training shall be provided through the existing Navy training structure. Guidelines in applying human engineering design criteria and principles in the design of the equipments shall be in accordance with good engineering practices, MIL-M-46855B, and MILP-46855T. Human factors shall be considered in the design of BFTT.

d. Computer Resources. BFTT software shall be developed/acquired under DOD-STD-2167A. Interfaces with tactical systems shall not inhibit, interfere, or reduce the capabilities of the combat system functions, procedures, or operator actions. BFTT computers shall provide for a minimum of 50% reserve memory and processing capacity in accordance with DOD-STD-2167A.

e. Standard Equipments. Maximum use of Non-Developmental Items (NDI) including Commercial off the Shelf (COTS) hardware is encouraged. The BFTT program will meet the Standard Hardware Acquisition Reliability Program (SHARP) guidelines.

f. Other Logistic Considerations. RDT&E funding shall be separately identified with program initiation for logistics planning and analysis of operational availability. BFTT will require online access and updates to standard data bases: intelligence, threat library, DMA mapping, combat system capabilities, etc., and standard algorithms for: earth model, kill probabilities, battle damage assessment, etc.

6. Infrastructure Support and Interoperability.

a. Command, Control, Communications, Computers and Intelligence (C^4I). BFTT shall be integrated into the Naval C^4I architecture to perform non-intrusive monitoring of C^4I activities in order to assess the tactical performance of the exercise participants. The monitoring circuitry shall be fail-safe: a failure in a BFTT component shall not degrade Fleet C^4I capabilities. BFTT may use excess capacity on tactical communication circuits (data and voice) on a not-to-interfere basis to support pre-mission coordination and post-mission debrief functions. For time critical functions during a training exercise, BFTT must perform at full capability with no degradation on tactical C^4I functions. Since BFTT is not a combat support system, any system unique communication structures need not be capable of surviving battle damage or providing low probability-of-intercept (LPI) characteristics. However, such BFTT unique communication structures must be secure (i.e., encrypted) and be capable of operating in an electromagnetic environment that includes intentional jamming [e.g., FTRG (Fleet Tactical Readiness Group)] of fleet tactical frequencies.

b. Transportation and Basing. Packing and packaging for transport and storage shall be in accordance with MIL-STD-1367. Equipment shall be transportable by air, rail, ship, barge, or truck. Design for transport shall conform to the requirements of MIL-E-17555 or MIL-STD-1188.

c. Standardization, Interoperability, and Commonality. All items with the same part numbers shall be functionally and physically interchangeable in accordance with MIL-M28787A. The training network shall conform with DIS standards for scenario communication.

d. Mapping, Charting, and Geodesy Support. The scenario geographical elements shall consist of coast lines, digital terrain elevation data (DTED), political boundaries, digital feature analysis data (DFAD), ocean charts, air charts, and bathymetric data. Tools shall be provided to graphically manipulate, edit, and translate the geographical elements to any geographic point, world wide, regardless of current own ship latitude and longitude.

e. Environmental Support. The platform and shore site hardware shall be located in manned and environmentally controlled spaces. Interconnectivity hardware shall be appropriately designed for the anticipated environment and shall withstand the effects of temperature, corrosion, and moisture.

7. Force Structure. Current planning includes development, procurement, and deployment of the following BFTT improvements:

a. Organic Training System. The Organic BFTT System is being developed in order to build on existing or planned onboard trainers. Current planning is to provide organic BFTT systems for the following classes of ships in the priority order listed:

CLASS	NO.	CLASS	NO.	CLASS	NO.
1. CG 47	27	7. FFG 7 MOD6	12	12. MCM 1	14
2. DDG 51	22	8. LHD 1	6	13. NON-NTDS SHIPS	
3. DDG 993	4	9. LHA 1	5	LSD 41/49	11
4. CGN 36/38	*	10. SSN 688	**	AOE 1/6	8
5. CV/CVN	12	11. LCC 19	2	MHC 51	10
6. DD 963	31			LPH 12	1
				LPD 17	14

LEGEND:
* ERESS capability only
** Submarines are unfunded

Note: Reserve ships will be included with the ship class.

b. Scenario Generator/Controller. Current planning includes additions to the BFTT systems located FCTCLANT and FCTCPAC to enable them to function as the shore site for each coast. They will be upgraded to cover all warfare areas. Additionally, simulation in the vicinity of land masses and shallow water target modeling must be enhanced to support training in littoral regions. Limited scenario generation is included in the shipboard controller to enable ships to conduct unit level combatant system team training.

c. Interconnectivity. Current planning provides for communications connectivity to BASELINE 1 sites. The following homeports are being considered.

- Norfolk, VA
- San Diego, CA
- Pearl Harbor, HI
- Mayport, FL
- Everett, WA
- Ingleside, TX
- Mobile Bay, AL/Pascagoula, MS
- Newport, RI
- Yokosuka, Japan

The homeports will be adjusted based on Base Realignment and Closure (BRAC) decision.

8. Schedule Considerations. The system attains a partial operational capability in FY 93 with the completion of Baseline 0. IOC for individual warfare areas in Baseline 1 is incremental and based primarily on current embedded trainers available for networking in the fleet rather than warfare area priorities. Within currently available warfare areas, current, post Soviet threat priorities are used. IOC for Baseline 1 is FY 97 and full operational capability FOC by FY 2002.